REMARKS

Claims 30 through 56 were presented for examination in the present application and remain pending for consideration upon entry of the instant amendment.

The specification was objected to. The specification was amended accordingly. Reconsideration and withdrawal of the objections to the specification are respectfully requested.

Claims 30 through 34 and 44 through 47 were rejected under 35 U.S.C. 102(b) as being anticipated by Japan 11-226734A ("Takeshi"). Claims 35, 36, 48, and 49 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of U.S. Patent No. 6,498,321 ("Fulmer"). Claims 37 and 50 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of U.S. Patent No. 5,750,957 ("Kilty"). Claims 38 and 51 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of Kilty in view of U.S. Patent No. 3,968,340 ("Fernicola"). Claim 39 was rejected under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of Kilty and further in view of U.S. Patent No. 6,121,691 ("Renner"). Claims 40, 41, 53, and 54 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of U.S. Patent No. 5,349,156 ("Madigan"). Claims 42, 43, 55, and 56 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of U.S. Patent No. 6,031,203 ("Suzuki"). Claim 52 was rejected under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of Kilty and further in view of Renner.

Claim 30 now recites "A method of controlling a welding process having a plurality of welding cycles, comprising:

advancing and reversing a consumable electrode with respect to a workpiece; and dynamically regulating a rate of advancement and reversal of said consumable electrode within a short circuit welding cycle and instantaneously altering a melting rate of said consumable electrode during each of said plurality of welding cycles in response to predetermined voltage variations that are indicative of a short circuit or a short circuit rupture event that occurs during said short circuit welding cycle (emphasis added)".

Takeshi discloses a welding system that applies to arc length control of open-arc pulsed-MIG (pulsed-GMAW). In addition, the disclosed method involves adjusting the time between a series of applied current pulses (each of fixed width and amplitude and individually chosen to obtain one-drop-per-pulse) in response to the actual measured speed of the consumable electrode. The invention of Takeshi controls the welding process over a long period and does not control the metal transfer mechanism. Rather, the metal transfer is predetermined by utilizing the parameters necessary for one drop per pulse, a known technique.

Whereas the method of claim 30 applies to a "short circuit welding cycle", the invention of Takeshi is applicable only to the open-arc (pulsed transfer) process.

In addition, claim 30 recites "instantaneously altering a melting rate of said consumable electrode during each of said plurality of welding cycles (emphasis added)". That is, the presently claimed method recites rapid controlled changes to electrode advancement within a single welding cycle (and

adjustment of the instantaneous melting rate in equal time frames). In contrast, however, Takeshi discloses the adjustment of the melting rate which takes effect over several (3-5) welding cycles. As such, Takeshi fails to disclose or suggest the altering of the melting rate now recited by claim 30.

Next, claim 30 recites "advancing and reversing a consumable electrode with respect to a workpiece (emphasis added)".

There are key differences between the open-arc approach disclosed by Takeshi and the presently claimed invention that utilizes a short circuiting approach. For example, in terms of the molten metal transfer process, the Takeshi open arc process has a growth droplet with pinch that drops at the end of the arc weld when surface tension reaches a critical point as determined by pre-programmed pulse parameters (as stated above). In the presently claimed short-circuit approach, a fast-growing molten metal droplet forms that doesn't drop off but rather hangs at the end of the electrode and eventually touches the welding plate, bridging the arc gap. This mode of metal transfer may be induced naturally by choice of welding parameters but suffers from instability. This is why the presently claimed method utilizes an adaptive control technique to control the current waveform, in combination with a backwards and forwards movement of the consumable electrode.

This forces the transfer of the molten metal from the welding wire to the weld pool in a more rigorously controlled manner than was previously available. This differences means that systems applied to the open-arc approach do not translate

to the short-circuit process. Therefore, something achieved in the Takeshi system cannot obviously be applied to a short-circuit system. Moreover, the presently claimed method and system focuses on the metal transfer control (physical detachment of material from the welding wire). This is not even an issue in the Takeshi system.

Consequently, Takeshi fails to disclose or suggest the advancing and reversing of the consumable electrode recited by claim 30.

Applicants respectfully submit that Takeshi fails to disclose or suggest claim 30. To summarize, Takeshi fails to disclose or suggest each of the following limitations of the method recited by claim 30: "short circuit welding cycle"; "advancing and reversing a consumable electrode with respect to a workpiece"; and "instantaneously altering a melting rate of said consumable electrode during each of said plurality of welding cycles". In addition, none of the cited art discloses or suggests these missing features.

As such, for at least these reasons, claim 30 is in condition for allowance. Claims 31 through 43 depend from independent claim 30 and are in condition for allowance for at least the reasons given above for claim 30.

Independent claim 44 now recites "A short circuit arc welding system comprising: a power source, and a control unit and means for advancing and reversing a consumable electrode with respect to a workpiece during a welding process, said consumable electrode being energized by said power source to

cause said consumable electrode to supply molten material to said workpiece, wherein said means for advancing and reversing is controlled by said control unit to dynamically regulate a rate of advancement and reversal of said consumable electrode within a short circuit welding cycle in response to an event occurring during said welding process indicated by predetermined voltage variations that are indicative of a short circuit or a short circuit rupture event that occurs during said short circuit welding cycle.

Takeshi, either alone or in combination with the cited art, fails to disclose or suggest any of the following limitations of claim 44: "a short circuit arc welding system"; "means for advancing and reversing a consumable electrode"; or a "means for advancing and reversing ... to dynamically regulate a rate of advancement and reversal of said consumable electrode within a short circuit welding cycle". As such, the combination of cited art fails to disclose or suggest claim 44.

Claim 44 is in condition for allowance. Claims 45 through 56 depend from independent claim 44 and are in condition for allowance for at least the reasons given above for claim 44.

In addition, in regards to the rejections of claims 35, 36, 48, and 49 under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of Fullmer, Applicants submit that Fulmer uses voltage and current to improve stability of the power supply, not to directly influence individual short circuit events or process control. This is contrary to the scope of claims 35, 36, 48, and 49. Thus, the combination of Takeshi and Fulmer fails to disclose or suggest claims 35, 36, 48, and 49.

In regards to the rejections of claims 37 and 50 under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of U.S. Patent No. 5,750,957 ("Kilty"), Applicants submit that Kilty discloses a method of sampling voltage and current, and using statistical analysis of these signals to detect a faulty welding condition. The analysis and decision rate is approximately 1 second. The sampling frequency is approximately 2kHz. The action taken upon detection of the fault is not related to instantaneous high-speed control of the process. In addition, the invention of Takeshi also uses a different frequency, which is not instantaneous control and does not propose any instantaneous method of control.

As such, the combination of Takeshi and Kilty fails to disclose or suggest claims 37 and 50, as asserted.

In regards to the rejections of claims 38 and 51 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view Kilty in view of U.S. Patent No. 3,968,340 ("Fernicola"), Applicants submit that Fernicola describes a slow-start electrode advancing system for the improved starting of aluminium electrodes in the MIG process. It is essentially a 2-speed system, starting at a slow speed and then increasing to the normal running speed when the arc is established. It does not teach or disclose the possibility of altering the electrode advancement rate in response to process events. It teaches a method only for the starting of a welding process, not its ongoing control once the process is started. Furthermore, Fernicola does not disclose or suggest reversal of the electrode.

As such, the combination of Takeshi, Kilty, and Fernicola fails to disclose or suggest claims 37 and 50, as asserted.

Regarding the rejection of claim 39 under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of Kilty and further in view of U.S. Patent No. 6,121,691 ("Renner"), Renner discloses a method to reduce welding current in a motor-generator welding system so that the combustion-engine stall condition under heavy load is avoided. The Renner system is not (and could not be) instantaneous in the same way that our system is. It is not controlled by truly instantaneous events and is based on a motor-generated control system, which is vastly different to our control system (having a very slow response rate typically of the order of 0.5 to 2 seconds).

As such, the combination of Takeshi, Kilty, and Renner fails to disclose or suggest claim 39, as asserted.

Regarding the rejection of claims 40, 41, 53, and 54 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of U.S. Patent No. 5,349,156 ("Madigan"), Applicants submit that the system of Madigan merely montitors and does not propose a mechanism for resultant control.

As such, the combination of Takeshi and Madigan fails to disclose or suggest claims 40, 41, 53, and 54, asserted.

Regarding the rejection of claims 42, 43, 55, and 56 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of U.S. Patent No. 6,031,203 ("Suzuki"),

Applicants submit that the systems of Takeshi and Suzuki determine the stability of a short circuit over a number of welding cycles (refer to their references and use of standard deviation and mean values, which demonstrate this). Further, the systems provide a method for assessing stable or unstable welds but no intervention is proposed. There is no method of corrective control. In contrast, present invention applies a control that is instantaneous over one cycle. The claimed system of control could not even be applied to the Takeshi welding system that is how different they are.

As such, the combination of Takeshi and Suzuki fails to disclose or suggest claims 42, 43, 55, and 56, as asserted.

Regarding the rejection of claim 52 under 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of Kilty and further in view of Renner, Applicants submit that the cited art uses mean current control, which is obviously determined over more than 1 weld cycle. The claimed present invention utilizes a reference that is obtained in period of short circuit or arcing (typically 2 milliseconds and 10 milliseconds, respectively) and instantaneously controls wire feed and current within these time frames. The prior art uses a very slow process and only uses a forward movement of the wire. In addition, the pending claims utilize a "reversal" wire movement. These movements of the wire are controlled in similarly brief time frames.

Thus, the combination of Takeshi, Kilty, and Renner fails to disclose or suggest claim 52, as asserted.

For all of the reasons stated above, Applicants

respectfully submit that claims 30 through 56 are in condition for allowance. Reconsideration and withdrawal of the rejections to claims 30 through 56 are respectfully requested.

In view of the above, it is respectfully submitted that the present application is in condition for allowance. Such action is solicited.

If for any reason the Examiner feels that consultation with Applicants' attorney would be helpful in the advancement of the prosecution, the Examiner is invited to call the telephone number below.

Respectfully submitted,

July 27, 2009

Charles N. J. Ruggiero
Reg. No. 28,468
Attorney for Applicant(s)
Ohlandt, Greeley, Ruggiero & Perle, L.L.P.
One Landmark Square, 10th floor
Stamford, CT 06901-2682
Tel: (203) 327-4500
Fax: (203) 327-6401